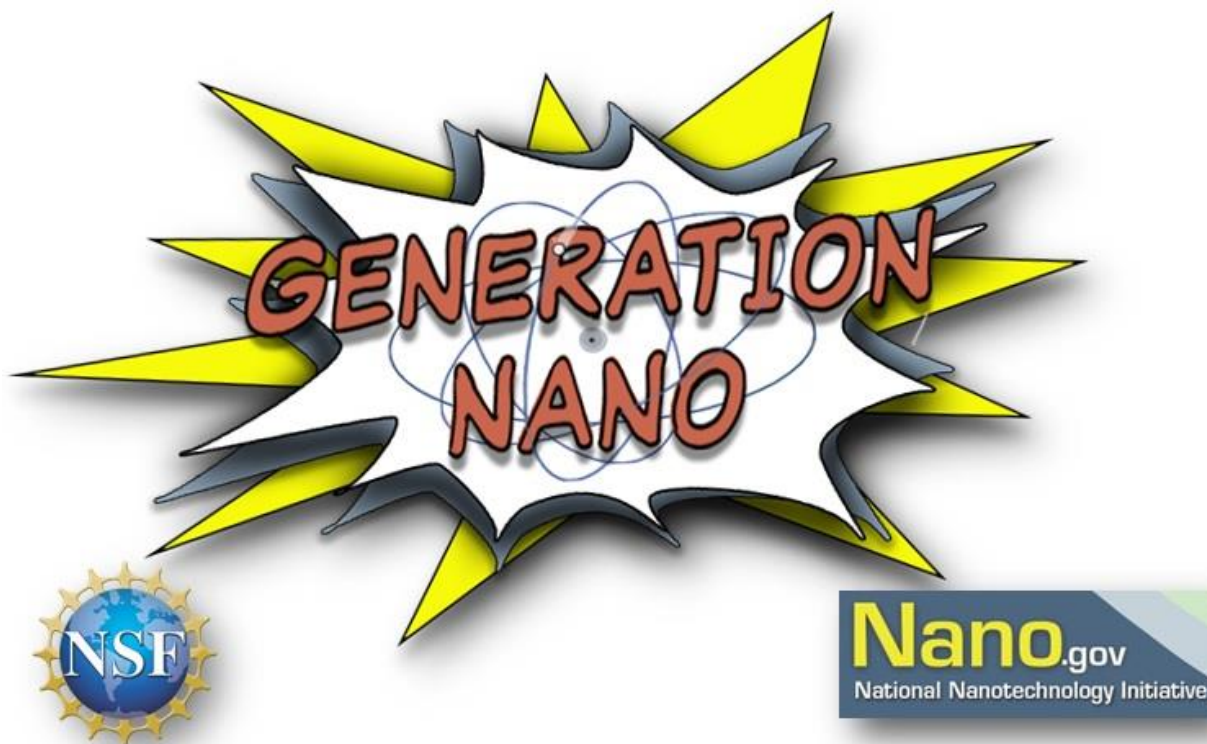


The National Science Foundation and the
National Nanotechnology Initiative present



Small Science, Superheroes

Participants' Guide
2016-17

DESCRIPTION

You are invited to compete in “Generation Nano: Small Science, Superheroes,” a competition that asks high school students to submit an original idea for a unique superhero who uses nanotechnology to undertake a societal mission. Students will submit a short, written entry, as well as a short video and comic strip, that illustrates their superhero in action using nanotechnology. Winners will receive cash prizes.

The idea of the superhero armed with fantastical powers has mesmerized the world for nearly a century. The ability to fly without wings, climb buildings like a gecko or see through walls is popularly interpreted as magical, with no scientific foundation. As we make advances in nanotechnology and materials research, we’re discovering that superhero powers may not be that farfetched. Through nanotechnology applications like targeted drug delivery, smart materials, molecular motors, advanced sensors and artificial red blood cells, we may not have to wait until that fateful day we’re bitten by a radioactive spider in order to become superhuman!

The [National Science Foundation](#) (NSF) and the [National Nanotechnology Initiative](#) (NNI) are excited to continue “Generation Nano: Small Science, Superheroes”! The competition asks high school students to choose a societal area to focus on and then design nanotechnology-enabled gear for an original superhero. Students can envision gear that is grounded in current research but not yet possible, allowing them to learn about the potentials and limitations of real-world nanotechnology. Students will first identify one societal mission that they will address from a list of four and then submit an entry with three components: a written section, a short comic strip and a 90-second video. The entry should introduce their superhero and demonstrate how they incorporated nanotechnology research into their hero’s story to address their chosen mission.

Who: High school students -- individuals or teams of two to three

What: A written entry, a two - three page comic strip and a 90-second video that:

- Introduces the hero and their story.
- Explains importance and potential impact of societal mission.
- Describes nanotechnology usage.

When: Competition opens Oct. 5, 2016; submissions due by Jan. 31, 2017, 11:59 p.m. Eastern Standard Time.

Where: Learn more and submit entry at nsf.gov/GenNano.

Why: To promote early interest in nanoscale science, technology, engineering and mathematics.

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SOCIETAL MISSIONS (CATEGORIES)

Students must choose one of the four societal missions (or categories) listed below and describe how their superhero uses nanotechnology to make improvements in that area. Their use of nanotechnology could involve a wearables (e.g., armor, a suit, etc.), a gadget or tool, a method of transportation or something else, such as a medical treatment or physiological enhancement.

Societal missions to choose from (choose one):

- Nanotechnology for Justice--These superheroes defend the defenseless against criminals, bullies, supervillains and others who wish to do harm.
- Nanotechnology for Relief--These superheroes bring aid to victims of disasters, famine, drought and other situations where people are in need.
- Nanotechnology for Health--These superheroes strive to heal the sick and injured.
- Nanotechnology for the Environment--These superheroes take aim at clean energy, pollution control and a sustainable future.

ENTRY GUIDELINES

Entrants should review the entry form on the online [platform](#) for more details about the submission requirements and process. The platform is where entrants will register and submit their entry and is accessible through NSF.gov/GenNano. A complete entry consists of three components: a written entry, a two-three page comic strip and a 90-second video entry, as described below.

Teams must choose a team leader who **must initially register their team and invite all team members to join**. All team members must then join and provide the required personal information. Any team member can then submit the team's entry.

A successful entry will be original, creative and visually appealing. No gratuitous violence or other inappropriate content will be permitted.

Written Entry

Each section has a 1,600-character limit including spaces (about 250 words). Your written entry should address the questions below. In addition, each entrant will be asked to write a short (140 character) tagline for their hero and a 200-word summary describing your superhero's story and their nanotechnology-enabled societal mission.

1. **Who is your superhero?** Name your superhero. Who are they and what is their story? Clearly and succinctly describe the main attributes of your hero and provide any necessary background information about them, including abilities, accessories and strengths and weaknesses.
2. **What is your superhero's societal mission?** Why did you choose this mission? Why is it important? What are the potential societal impacts of the hero accomplishing their mission?

- 3. How does your superhero use nanotechnology for their mission?** Describe your superhero's nanotechnology-enabled accessory or gear. Is it something they wear, use to travel, a gadget or something else? Make sure the description focuses on the attributes of the gear: What can it do and why? How does it help the superhero? Describe how your superhero incorporates nanotechnology to address their societal mission. Give a background of the research behind your chosen technology. How does current research make your solution possible? What further reasonable advances are needed to make the solution a reality? This section does not need to be overly technical, but you should include at least two references to current nanotechnology research either in the form of popular news articles or scholarly journal articles (not Wikipedia), to support your explanation of the technology. The technology doesn't have to be currently possible, but there must be research to support that it may be in the future. Extra space will be given for references.

Comic Strip and Video Entries

Each element should:

- Clearly introduce the superhero, the nanotechnology used and tell a story; and
 - Have a unified voice, vitality and energy.
 - Emphasize how the nanotechnology is useful in overcoming the story's conflict.
 - Give insights not provided in the written entry to create a novel presentation.
- A successful entry will be visually striking and edited to a high standard and should deliver clear and understandable messages using nontechnical language.
- The comic strip and video should have enough detail that it could stand alone and tell the hero's story and how they use nanotechnology.
- Provide a short caption to be displayed with each.
- Not include any copyrighted imagery or items (resources for non-copyrighted images below).

Comic Strip Entry

The comic strip entry:

- Should be composed either by hand or using a digital comic strip generator or drawing program.
- Should be two to three pages in length.
- Should be a JPEG type file.

Video Entry

The video entry:

- Should be a 90-second single video.
- Should complement your comic and written entry. The video does not have to be an animated version of your comic and can be in whatever style you choose.

- Does not have to include credits but if it does, these will be included in the 90-second time limit.
- Must be uploaded to YouTube and entrants must provide a link to the video on the entry form AND submit their video file (an MOV file recorded in HD at a minimum).
- Should have a resolution of 1280 x 720 and be submitted via the entry form.

THE PROCESS AND PRIZES

This section describes how to submit an entry, the scoring process and judging criteria, the prizes, and the overall timeline of event. Please carefully review.

Entry Submission

The entry submission process is as follows:

- Register on the Generation Nano [platform](#).
 - Teams must choose a team leader who **must initially register their team and invite all team members to join**. All team members must then join and provide the required personal information. Any team member can then submit the team's entry.
- Complete entry information.
- Upload required images, videos and forms.
- Submit completed entry before submission deadline.

Scoring/Judging Criteria

The scoring/judging process/criteria are as follows:

- All entries will first be screened for compliance with the rules.
- Each entry will be anonymously evaluated based on the stated criteria and will be scored on a sliding scale by each judge.
- NSF reserves the right to adjust the ratios of finalists based on the number and quality of submissions. Individuals and teams will be notified if they have progressed to the next round by email.
- The judges:
 - Are experts with expertise in nanotechnology and/or graphic design.
 - Will convene separate panels for each judging round.
 - Will score each entry on the criteria described below.
- Scoring – based on three categories for a total of 100 points:
 - 1) Use of nanotechnology (50 percent)--How accurately did the entrant incorporate nanotechnology into their story to address the chosen societal mission
 - 2) Creativity (25 percent)--The originality and quality of both the superhero and his or her story, as well as the application of nanotechnology to address the societal goal chosen by the entrant.
 - 3) Artistic and technical quality (25 percent)--The visual appeal and refined execution of the comic strip and video.

Prizes

- First place winner receives \$1500.
- Second place winner receives \$1,000.
- People's choice award winner receives \$750.

Timeline

- Submission window: Opens Oct. 5, 2016; closes Jan. 31, 2017, at 11:59 p.m. Eastern Standard Time.
- Preliminary round (semifinalists selected): Early Feb. 2017.
- Semifinalist round (finalists selected): Mid-Feb 2017.
- Finalists round (first and second place selected): Early March 2017.
- People's Choice selected: March 2017. Each finalist's comic strip and video will be posted on the competition website for public viewing and voting.

RESOURCES

Students may choose to utilize the following resources for nanotechnology research and multimedia resources for their comic strip and video generation (but are not limited to these resources).

Nanotechnology Resources

- National Science Foundation
 - NSF Nano Education for Kids:
<https://www.nsf.gov/crssprgm/nano/education/kids.jsp>.
 - NSF Nanotechnology: Super Small Science video series:
https://www.nsf.gov/news/special_reports/nanotechnology/.
 - Science Nation
 - Nanofilters:
https://www.nsf.gov/news/special_reports/science_nation/nanofilters.jsp.
 - Wearable nano:
https://www.nsf.gov/news/special_reports/science_nation/wearablenano.jsp.
 - Terawatt challenge:
https://www.nsf.gov/news/special_reports/science_nation/terawattchallenge.jsp.
 - Nanomanufacturing:
https://www.nsf.gov/news/special_reports/science_nation/nanomanufacturing.jsp.
 - Spray-on solar panels:
https://www.nsf.gov/news/special_reports/science_nation/sprayonsolar.jsp.
 - Bio-med textiles:
https://www.nsf.gov/news/special_reports/science_nation/biomedtextiles.jsp.
 - Neon cancer detector:
https://www.nsf.gov/news/special_reports/science_nation/neoncancer.jsp.

- National Nanotechnology Initiative: <http://www.nano.gov/>.
 - Basics of Nanotechnology: <http://www.nano.gov/nanotech-101#content>.
 - Nanotechnology and You: <http://www.nano.gov/you#content>.
 - NanoTube – NNI: <https://www.youtube.com/playlist?list=PLy4wjGabGUTZhfhHnCe45Yqb4i1Due1Xk0>.
- *Wired* article about graphene and Iron Man: <https://www.wired.com/2015/01/iron-man-graphene/>.
- MIT's Institute for Soldier Nanotechnology: <http://isnweb.mit.edu/>.
- Current available nanotechnology products: <http://www.nanotechproject.org/cpi/>.
- Article on nanotechnology's potential: <http://io9.gizmodo.com/how-medical-nanotech-will-change-humanity-forever-1476398307>.
- "What is Nanotechnology" video: <https://www.youtube.com/watch?v=9PRSzkqFLEs&list=PL556DA4E9D467F799>.
- NISE Net's website: <http://whatisnano.org/>.
- Slate "How Small is the Nanoscale" video: http://www.slate.com/articles/technology/future_tense/2016/09/how_small_is_the_nanoscale.html.
- Understanding Nano – Nanotechnology: <http://understandingnano.com/>.
- PBS - Making Stuff: Smaller: <http://www.pbs.org/video/1754649512/>.

Multimedia Resources

- Superhero resources:
 - Free Smithsonian online course "The Rise of Superheroes and Their Impact on Pop Culture": <https://www.edx.org/course/rise-superheroes-impact-pop-culture-smithsonianx-popx1-1x-2>.
- Comic generation:
 - Pixton (not free): <https://www.pixton.com/>.
 - Toon Doo: <http://www.toondoo.com/>.
 - Chogger: <http://chogger.com/>.
 - Marvel: http://marvel.com/games/play/34/create_your_own_comic.
- Free, non-copyrighted image sources:
 - Freerange Stock: <https://freerangestock.com/>.
 - MorgueFile: <http://morguefile.com/>.
 - Wikimedia Commons: https://commons.wikimedia.org/wiki/Main_Page.
- Free, non-copyrighted audio sources:
 - Freesound: <https://www.freesound.org/browse/>.
 - MusOpen: <https://musopen.org/music/>.
 - Jamendo: <https://www.jamendo.com/?language=en&p=tags>.
 - Sound Bible: <http://soundbible.com/>.
 - Free Music Archie: <http://freemusicarchive.org/>.

SUMMARY OF RULES

Please carefully review all of the following rules.

Eligibility

- Each submission must be made by an individual student or a team of two or three students.
- All students must be enrolled in a high school or be home schooled in the U.S., its territories or possessions at the time of entry (e.g., the fall 2016 semester or the spring 2017 semester), and be in good standing.
- All students must be 13 to 19 years of age at the time of entering the competition.
- Students are limited to participating in one project for this competition.
- Students must be U.S. citizens, nationals or permanent residents.
- Each entrant must submit a Parental/Guardian Permission Form, a Photo Consent Form and NSF 1515 form, available on the competition platform.
- Previous Generation Nano finalists are not eligible for future competitions; however, previous semifinalists are eligible to compete again.
- Employees, contractors, officers or judges of the sponsoring organizations and their children are not eligible to enter the competition.

Entry Rules

- All entries must be received during the competition submission window.
- All entries must be submitted in English.
- A competition entry constitutes an agreement to adhere to the rules and stipulations set forth by the contest sponsors.
- Each entrant certifies, through submission to the contest, that the entry is their own original, creative work and does not violate or infringe the creative work of others, as protected under U.S. copyright law or patent law.
- By entering the contest, the entrant agrees to hold harmless, NSF for all legal and administrative claims to include associated expenses that may arise from any claims related to their submission or its use.
- All judges' decisions are final and may not be appealed.
- Entrants retain all copyright and equivalent rights but give NSF nonexclusive rights to use their names, likenesses, quotes, submissions or any part of the submissions for educational publicity and/or promotional purposes. These include but are not limited to website display, print materials and exhibits.
- NSF will not be responsible for any claims or complaints from third parties about any disputes of ownership regarding the ideas, solutions, images or video.

Other Rules

- Any entrant or entry found in violation of any rule will be disqualified.
- Winners and their parents or guardians are responsible for all taxes or other fees connected with the prize received and/or travel paid for by the sponsoring organization.

- NSF reserves the right to modify or cancel the competition at any time during the duration of the competition for any reason, including but not limited to an insufficient number of qualified entries received.
- Should NSF decide to bring winning contestants to Washington, D.C., or to any other location for promotional and other purposes, expenses paid by NSF will be within the limits set forth in law according to federal travel regulations.
- All contestants agree that they, their heirs and estates shall hold harmless the United States, the employees of the federal government and all employees of NSF for any and all injuries and/or claims arising from participation in this contest, to include that which may occur while traveling to or participating in contest activities.
- All contestants must submit a Parental/Guardian Permission Form and Photo Consent Form, available on the competition platform.
- All finalists must be accompanied by a parent/guardian.
- NSF has the final say on any point not outlined in the entry rules.

FREQUENTLY ASKED QUESTIONS

- **Can entrants be from any high school anywhere in the U.S.?**
Yes, all student participants must be enrolled in high school or be homeschooled in the U.S., its territories or its possessions and be between the ages of 13 and 19 at the time of entry (i.e., the fall 2016 semester). Please review the [Summary of Rules](#) for more information.
- **Is there a specific grade-point average that qualifies a student to be "in good standing"?**
No, we rely on your own educational institution to determine if you are in good standing.
- **What should I submit?**
A complete entry consists of three components: a written entry, a video and comic strip entry. Please review the [Entry Guidelines](#) for more information.
- **What is the length limit for the written entry?**
The written entry must be submitted in three sections, each of which is limited to 1,600 characters, including spaces. Please review the [Entry Guidelines](#) for more information.
- **How will my comic strip entry be submitted and in what form?**
You are required to submit your comic strip as a high-resolution JPEG file on the competition platform.
- **How will my video entry be submitted and in what form?**
You must upload video submissions to YouTube and provide a link to the video on the entry form AND submit the video file (an MOV file recorded in HD at a minimum resolution of 1280 x 720) via the entry form.
- **Does the video have to include credits identifying the video creator and any volunteers?**
No, your video does not have to include credits.

- **If I include credits on my video, are they included in the 90 second limit?**
Yes, the entire video should be 90 seconds.
- **Once I submit my video, can I revise it or replace it with another video prior to the Jan. 31 deadline?**
No. Once you submit a video to the contest it is considered a final submission and cannot be revised or replaced. However, you can save your entry on the competition platform and edit it before submitting.
- **What characterizes a winning entry?**
Entries are scored based on creativity, scientific accuracy and the visual appeal of the comic strip and video. Please review [Process and Prizes](#) for more information.
- **How will semifinalists and finalists be notified?**
All winners will be notified via email, either to your own email or to a parent/guardian or trusted teacher's email account.
- **Do I need parental/guardian permission to participate?**
Yes. Every student and their parent or guardian must fill out and submit a Parental/Guardian Permission Form and a Photo Consent Form, available on the competition platform. Please review [Summary of rules](#) for more information.
- **Can an individual or team create more than one superhero per entry?**
Yes, a single entry may include multiple superhero characters (i.e. a pair or a team), but remember each individual or team entrant may only submit one entry each.